CLAIMS

1. A method for the precise mass determination of ions in a time-of-flight mass spectrometer that uses orthogonal ion injection and has a pulser, an ion detector and a measuring device for measuring ion currents at the detector, the method comprising:

    (a) measuring, with the measuring device, ion current signals at the detector cyclically without regard to the passage time of the ions and accumulates the results in a store;

    (b) pulsing out ions in the pulser synchronously with the measuring cycles;

    (c) determining an association of the measured ion current signals with ion pulses using at least one of the shape of the ion current signal, the shape of the ion current signal group, and the velocity of the ions; and

    (d) determining, using said association of ion current signals to said ion pulses, flight times and specific masses of the ions.

2. A method according to Claim 1, wherein the association of the measured ion current signals with one of the foregoing pulses is determined using a width of the ion current signal.

3. A method according to Claim 1, wherein the association of the measured ion current signals with one of the foregoing pulses is determined using an isotopic distribution in the ion current signal group and through the distances between the ion current signals within the ion current signal group.

4. A method according to Claim 1, wherein the association of the measured ion current signals with one of the foregoing pulses is determined using a width of the ion current signal group and through the pattern of the ion current signal groups of various charge states.

5. A method according to Claim 1, wherein the association of the measured ion current signals with one of the foregoing pulses is determined using an analysis of the velocity of the ions.

6. A method according to Claim 5, wherein the analysis of the velocities is performed using two spectra, the two spectra being obtained using two detectors for which the flight paths of the ions have different lengths.

7. A method according to Claim 1, wherein the pulser of the time-of-flight mass spectrometer is controlled by the measuring device.